



PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hideaki AMANO

Application No.: 09/657,050

Filed: September 7, 2000

For: DEVICE AND METHOD FOR
PLASMA PROCESSING

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) Group Art Unit: 1762
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) Examiner: M. Padgett
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Commissioner for Patents
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Sir:

DECLARATION UNDER 37 C.F.R. § 1.132

I, Hideaki Amano, do hereby make the following declaration:

1. I am the inventor of the subject matter claimed in U.S. Application No. 09/657,050. I have been employed by Tokyo Electron Limited for 13 (no.) years, and have been working in the field of plasma. I have 4 years of university education, and graduated with a degree in chemistry.

2. Plasma processing systems are designed so that the magnetic field of one plasma processing chamber does not affect the plasma deposition in other processing chambers, and likewise, does not overly affect the travel path of microwaves in wave guides of other plasma processing chambers. Additionally, passing microwaves through one wave guide does not generate an electrical or mechanical field that would overly affect the travel path of microwaves in an alternate wave guide. Because of this,

during design of a plasma processing apparatus, an engineer of ordinary skill in the art would not be motivated to position the bent wave guide in relation to the transfer direction of the transfer arm so that it is the same for each plasma processing unit in order to maximize separation of the chambers and wave guides to minimize interference and prevent distortion of each unit's electric field. Instead, an engineer considers many factors in designing a plasma processing apparatus, and an engineer may, in fact, design a plasma processing apparatus with a bent wave guide having the configuration shown in FIGs. 6 and 7.

3. The Specification of the '050 application explains that the electric field distribution of waves introduced from the wave guide, and the plasma concentration on the substrate resulting therefrom, varies within each plasma processing unit according to the position of the wave guide relative to the substrate. See Specification, page 2, line 30-page 3, line 25. This problem of a non-uniform electric field distribution described in the specification is mainly caused by the bend in the wave guide.

4. The plasma processing apparatus described and claimed in the '050 application includes several different elements. Some of these are: a transfer arm adapted to transfer a substrate to a mounting stage in a transfer direction that is fixed for each of the plasma processing units; a reference point of the substrate is always positioned the same with respect to the transfer arm; and for each of the plasma processing units, the position of the wave guide in relation to said transfer direction of the transfer arm is the same. Together, these features establish a consistent position of the wave guide relative to the transfer direction of the transfer arm and relative to the reference point of the substrate for each plasma processing unit. Therefore, according

to the present invention, the position of the wave guide in relation to a reference point on the substrate is the same for each of the plasma processing chamber units.

Because of this, the deviation of the electric field intensity distribution in each unit is consistent with respect to the substrate transferred between units. See Specification, page 4, lines 12-23.

5. Because the non-uniform electric field distribution is not caused by interference from other processing chambers, it does not logically follow that one would position the bent wave guide in relation to the transfer direction of the transfer arm so that it is the same for each plasma processing unit to avoid interference between units.

6. Instead, an engineer having ordinary skill in the art would rely upon many factors to determine the placement of the wave guide. For example, overall footprint and cost of manufacturing are two factors considered in determining the design of plasma processing systems. A footprint is the surface area covered by the system. An engineer having ordinary skill in the art would consider the overall footprint of a plasma processing system to be at least one motivating factor to position each wave guide in relation to a transfer direction of a transfer arm so that it is not the same for each plasma processing unit. In fact, the background section of the present application describes a conventional plasma processing apparatus as an example of this.

7. In order to minimize the footprint and manufacturing costs, some conventional processing apparatuses have the configuration described in FIGs. 6 and 7. See Specification, page 1, lines 21-25. In FIGs. 6 and 7, the position of the wave guide in relation to the transfer direction of the transfer arm is not the same for each of the plasma processing units. Accordingly, the background section of the specification

provides reasons that an engineer would not position the wave guide in relation to the transfer direction of the transfer arm so that it is the same for each plasma processing unit in order to prevent physical hindrance of the structures. In fact, the wave guides may be positioned in any of a limitless number of other positions that prevent physical hindrance of the structures, including that shown in FIGs. 6 and 7. Accordingly, the proposition that an engineer of ordinary skill in the art would position the wave guide in relation to the transfer direction of the transfer arm so that it is the same for each plasma processing unit in order to prevent physical hindrance of the structures is not correct, as many factors are used to determine wave guide placement.

8. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: October 10, 2003

By: Hideaki Amano
Hideaki Amano